

REMARKS

Claims 1-24 are all the claims pending in the application. Claims 1-5 and 7-24 are rejected. Claim 6 is objected to but would be allowable if placed into independent form. Claims 1, 2, 7, 12, 17 and 22 are amended. Claims 3 and 11 are cancelled.

In amended claims 1, 2, and 22, “the local machining being carried out by plasma etching or a gas cluster ion beam” is based on the original claims 3 and 11 and the description at page 14, lines 18-19 of the original specification.

In amended claims 1 and 2, “said alkali treatment step thereby removing machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining by the plasma etching or the gas cluster ion beam and left on the surface of the glass substrate” is based on the descriptions at page 5, lines 12-14 and page 17, lines 6-10 of the original specification.

Likewise, in amended claim 22, “said acid or alkali treatment step thereby removing machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining by the plasma etching or the gas cluster ion beam and left on the surface of the glass substrate” is based on the descriptions at page 5, lines 12-14 and page 17, lines 6-10 of the original specification.

Amendments to claims 7 and 12 are based on the description at page 16, lines 1-2 from the bottom of the original specification.

The amendment to claim 17 is to delete inadvertent typing.

Claim Rejections - 35 U.S.C. § 103

Claims 1-5, and 7-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cardinale (6,015,640) further in view of Hata et. al. (JP 63-114,866) and Takeuchi et. al. (2002/0179576). This rejection is traversed for at least the following reasons.

Claims 1, 2 and 22 are independent claims. Each has been amended, as noted above, to further define the invention with respect to the local machining and the alkali treatment step. The claims as now amended are distinguishable over the prior art, taken alone or in combination, as detailed subsequently.

Cardinale

The Examiner applies Cardinale as the primary reference and states on page 2 of the Office Action that in Cardinale “a polished (i.e. -flattened) quartz substrate (i.e. -blank) is produced”. Applicants notes, however, that none of the claimed steps are expressly taught or are inherent in Cardinale.

Claimed Steps Not Disclosed

In fact, Cardinale merely describes “a polished silicon or quartz substrate” at column 1, line 59. That is, Cardinale only discloses a “quartz substrate” that has been polished. Cardinale does not disclose any of the claimed (1) profile measuring step, (2) flatness control step including the local machining by the plasma etching or the gas cluster ion beam, (3) polishing step, and (4) acid or the alkali treatment step of the amended claims 1, 2, and 22.

Claimed Order Not Disclosed

Cardinale also does not disclose that the method comprises the flatness control step including the local machining by the plasma etching or the gas cluster ion beam, the acid or the alkali treatment step, and the polishing step, carried out in this order to thereby make the surface of the glass substrate have a flatness and a surface roughness required to the glass substrate for the EUV mask blank in the amended claims 1, 2, and 22.

According to the invention, a glass substrate for an EUV mask blank can be produced by carrying out the flatness control step, the acid treatment step, and the polishing step in this order to thereby make the surface of the glass substrate have a flatness and a surface roughness required for the glass substrate for the EUV mask blank (see the description related to Example 1 of page 21, line 9 from the bottom through page 24, line 11 from the bottom of the instant specification; especially, the description of page 24, line 1 through page 24, line 11 from the bottom of the instant specification; and furthermore, see the description related to Example 2 of page 24, line 10 from the bottom through page 26, line 3 of the instant specification; especially, on the description of page 25, line 9 from the bottom through page 26, line 3 of the instant specification).

Examiner Admission That Polishing is Not Disclosed

The Examiner admits that Cardinale fails to specifically disclose several aspects of the claimed invention, including:

“-the specific usage of the process which is claimed by the applicant for polishing (i.e.- flattening) the top surface of the glass blank; and
-the production of a EUV glass blank with the specific level of smoothness, which is claimed by the applicant.”

The Examiner asserts, however, that the claimed polishing limitations would have been obvious on the basis of the teachings of Hata et. al. and Takeuchi et. al.

Hata et. al.

Hata et al does disclose that the glass substrate is first mechanically ground and is then wet etched in order to remove a damaged layer from the surface of the glass substrate. The glass substrate that has been ground with the use of abrasive particles is then etched in order to remove the damaged layer by about 50 to 50 μm (Abstract).

No Machining As Claimed

Hata et al is deficient in that it does not disclose that the local machining is conducted by plasma etching or by gas cluster ion beam, as now recited in the amended claims 1, 2, and 22. Hata et al only discloses machining by mechanically grinding, which inevitably causes a damaged layer having a thickness of about 50 to 50 μm . This is unacceptable in modern practice.

In the flatness control step including the local machining by the plasma etching or the gas cluster ion beam, the reference value for controlling the flatness is not greater than 0.5 μm . By the use of the reference value, the local machining by the plasma etching or the gas cluster ion beam is carried out in the manner described on page 16, line 2 from the bottom through page 17, line 1 of the original specification.

No Treatment As Claimed

Hata et al also fails to disclose “said acid (or alkali) treatment step thereby removing machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining by the plasma etching or the gas cluster ion beam and left on the surface of the glass substrate,” as recited in amended claims 1 , 2, and 22.

In sum, Hata et al does not disclose a method that comprises a flatness control step including the local machining by the plasma etching or the gas cluster ion beam, an acid or the alkali treatment step, and a polishing step, carried out in this order, as in amended claims 1, 2, and 22. This deficiency is not remedied by Takeuchi et al.

Takeuchi et. al.

Takeuchi et al also does not disclose “said acid (or alkali) treatment step thereby removing machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining by the plasma etching or the gas cluster ion beam and left on the surface of the glass substrate,” as expressly stated in amended claims 1, 2, and 22.

In sum, Takeuchi et al does not disclose a method that comprises a flatness control step including the local machining by the plasma etching or gas cluster ion beam, an acid or alkali treatment step, and a polishing step, carried out in this order, as recited in amended claims 1, 2, and 22.

Conclusion

Applicants therefore submit that claims 1, 2, and 22 are patentable. Moreover, the claims dependent from these claims also are patentable.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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